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The Oaks Plantation rice mill, Brookgreen Gardens, Georgetown County, South Carolina

James L. Michie

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WACCAMAW CENTER FOR CULTURAL AND HISTORICAL STUDIES
COASTAL CAROLINA UNIVERSITY
CONWAY, SOUTH CAROLINA

THE OAKS PLANTATION RICE MILL, BROOKGREEN GARDENS, GEORGETOWN COUNTY, SOUTH CAROLINA

by

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COASTAL CAROLINA UNIVERSITY, P.O. BOX 1954, CONWAY, S.C. 29526
(Associates of the South Carolina Institute of Archaeology and Anthropology, University of South Carolina)

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James L. Michie
Associate Director, Waccamaw Center for Cultural and Historical Studies,
Coastal Carolina University,
and
Associate Principal Investigator and Program Director, South Carolina Institute of Archaeology and Anthropology, University of South Carolina, Columbia

Waccamaw Center for Cultural and Historical Studies
(Associates of the South Carolina Institute of Archaeology and Anthropology, USC - Columbia)

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ACKNOWLEDGEMENTS

During the past five years a great deal of historical archaeology has been conducted at The Oaks plantation on Brookgreen Gardens. The plantation was intensively surveyed in the fall of 1992 which revealed the locations of eighteenth and nineteenth century house sites. After the report was completed we were asked to excavate the house site of Joseph and Theodosia Burr Alston. This was accomplished during the fall of 1993 and the beginning of 1994. Later in the fall of 1994, we returned and expanded the excavation which provided additional knowledge of architecture. The first two projects were initiated by the former President of Brookgreen Gardens, Mr. Gurdon L. Tarbox, Jr. and the Friends of Brookgreen, an independent volunteer support group. When we requested additional funding for the last project Mr. Lawrence Henry, current President of Brookgreen, had recently arrived. Funds for the project were generated and granted by the Friends of Brookgreen, whose interests support and enhance the overall network of Brookgreen Gardens.

In April of 1996, I received an invitation from Mr. William M. Weeks, Chief Operations Officer with Brookgreen, to conduct addtional research at The Oaks with my field archaeology class. I gladly accepted, and for three weeks in May my class excavated portions of the 1760s house site and then investigated the remnants of the rice mill. We deeply appreciate Brookgreen's continued interest in archaeology, and we feel privileged to have Mr. Weeks extend an invitation to us for an additional research opportunity.

Ms. Susan McMillan worked with us as a volunteer and we were fortunate to have her knowledge and experience. Not only did she assist with the small excavation at the old house site, but she assisted with the rice mill investigation and managed to find time to analyze the recovered artifacts. Her assistance was a major contribution to the project.

The students worked through the heat and humidity of an early summer, tolerated chiggers and ticks, and swarms of deer flies. Many thanks to Mr. Kris Asher, Mr. Richard Eddings, Mr. Joel Galvagni, Mr. Don Jones, Mr. Jason Jones, and Ms. Candace Reaves. Without their dedication to the project we never would have accomplished so much.

Mr. Bill Edmonds and Ms. Lisa Johnson of Instructional Media, Coastal Carolina University, visited and photographed the site, and later processed our film. We appreciate their enthusiasm, interest, and their continuous quality of work.

INTRODUCTION

The Oaks was one of many rice-producing plantations located on the eastern side of Georgetown County on a peninsula of land known as the Waccamaw Neck (Figures 1 and 2). Following its collapse and successive changes in ownership it was finally subsumed, with three other plantations, under the guidance and protection of Brookgreen Gardens. Ever since its abandonment in the latter part of the nineteenth century it passed through a succession of vegetation and now exists as a dense forest. All that remains are buried artifacts and scattered foundation footings.

The property associated with The Oaks has had a long history of private ownership which began in 1711. Early land use is not well recorded, but we do know that Joseph Allston established it as a formal plantation after he inherited it from his father, William Allston. After it was developed, he willed it to his grandson, also named Joseph Alston, whose father had changed the spelling of the original Allston name by eliminating an l. It was during this ownership that young Joseph married Theodosia Burr, daughter of Aaron Burr. Although the marriage began with hopes for happiness and longevity, it was soon followed by a series of tragedies that ended with the death of their child in 1812, Theodosia's death in 1813, and Joseph's death in 1816.

Following Joseph's death, the property passed on to several family members until well after the Civil War. After additional private ownership it was finally acquired by Archer and Anna Huntington in 1930. In addition to The Oaks, three adjoining plantations were also purchased: Laurel Hill, Springfield, and Brookgreen, which formed a sizable tract of land. By the time the lands were purchased, many of the plantation structures had either collapsed or burned and little remained except for a remnant number of slave cabins that were being used by local residents. Most of the land had succeeded into dense forests that were beginning to reflect the vegetation of a maturing environment. As a complement to the large tract, the Huntingtons began building formal gardens to display Anna's work, and then began acquiring bronze and marble sculptures. Mrs. Huntington, a talented and accomplished sculptor, contributed significantly with many of her works. Realizing that the property should be set aside for the future enjoyment of the public, the Huntingtons formed a trust designed to maintain the formal gardens. And it was Archer Huntington who envisioned the project as *a quiet joining of hands between science and art.*

Long before the gardens became public-oriented, most of the houses and other structures on The Oaks had disappeared and only memories remained. Somewhere in the densely wooded tract there were collapsed remains of slave cabins and overseer's houses, service buildings, and the house sites of different planters, including the one occupied by Joseph and Theodosia. Finding these sites had been a goal of Brookgreen Gardens' management and administrators for a long time, but a lack of funding had prevented an investigation. However, in 1992, the Friends of Brookgreen, through a successful fund-raising drive, were able to secure adequate resources for an intensive survey designed to reveal the plantation's spatial organization, with an emphasis placed on finding the site occupied by Joseph and Theodosia.

The seven week survey began in the fall of 1992, and when it was completed the plantation was thoroughly revealed. Not only were we able to isolate two rows of nineteenth century slave cabins, we were able to isolate a separate eighteenth century slave settlement, separate structures probably associated with plantation management, and at least two separate houses and a kitchen relating to plantation ownership. One of the latter house sites belonged to Joseph and Theodosia.

In November of 1993, the Friends of Brookgreen decided to move ahead with additional archaeological research. Now that we had defined the plantation in terms of temporal and spatial organization, and had identified specific locations, they wanted us to investigate the house site associated with Joseph and Theodosia. Although there were many research directions, one of the guiding themes involved size and appearance. We knew from the beginning that at least two houses had been built in the same locality: the house associated with Joseph and Theodosia, and a small slave cabin. The presence of two overlapping structures, one from the eighteenth century and

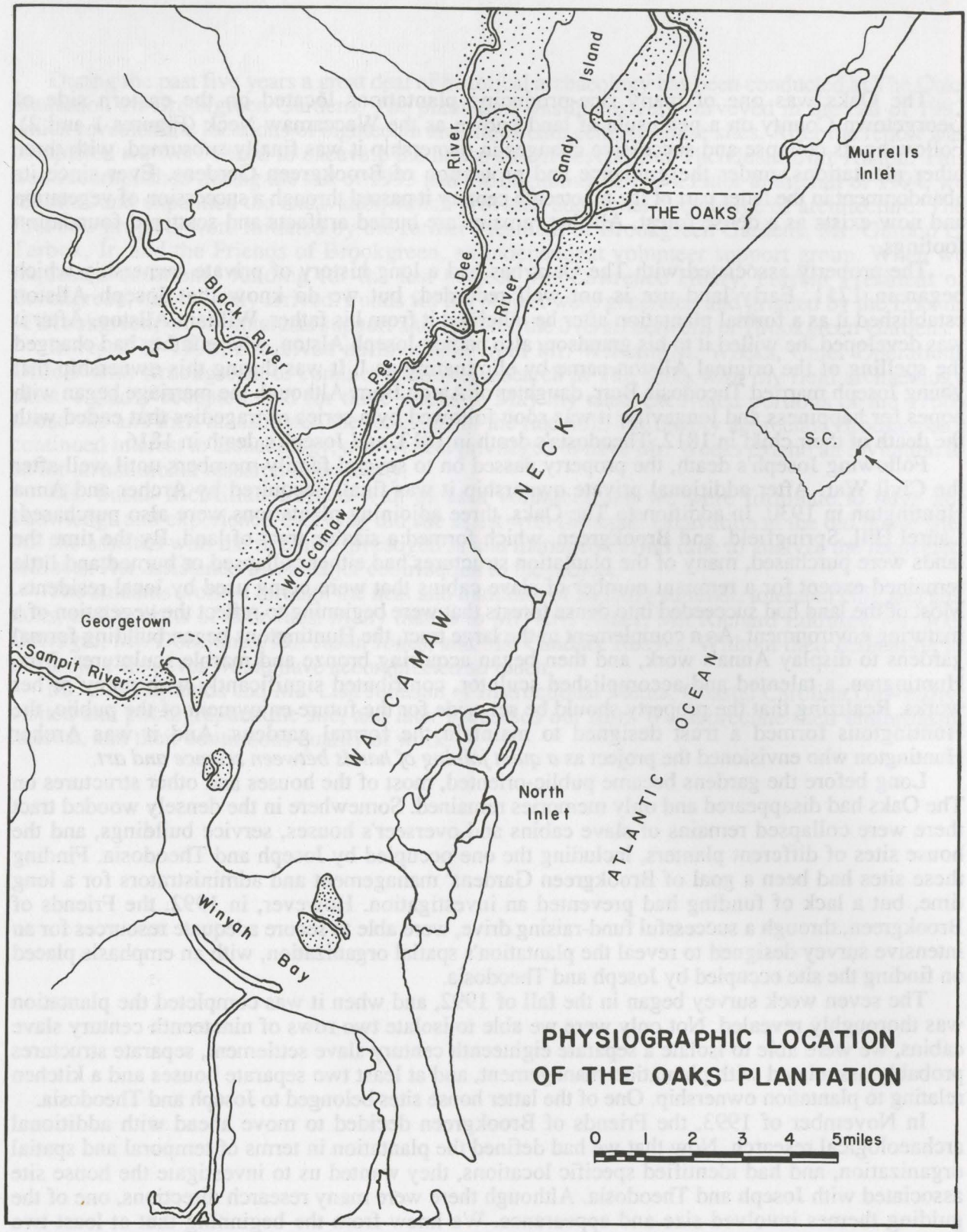


Figure 1. Physiographic Location of The Oaks Plantation.

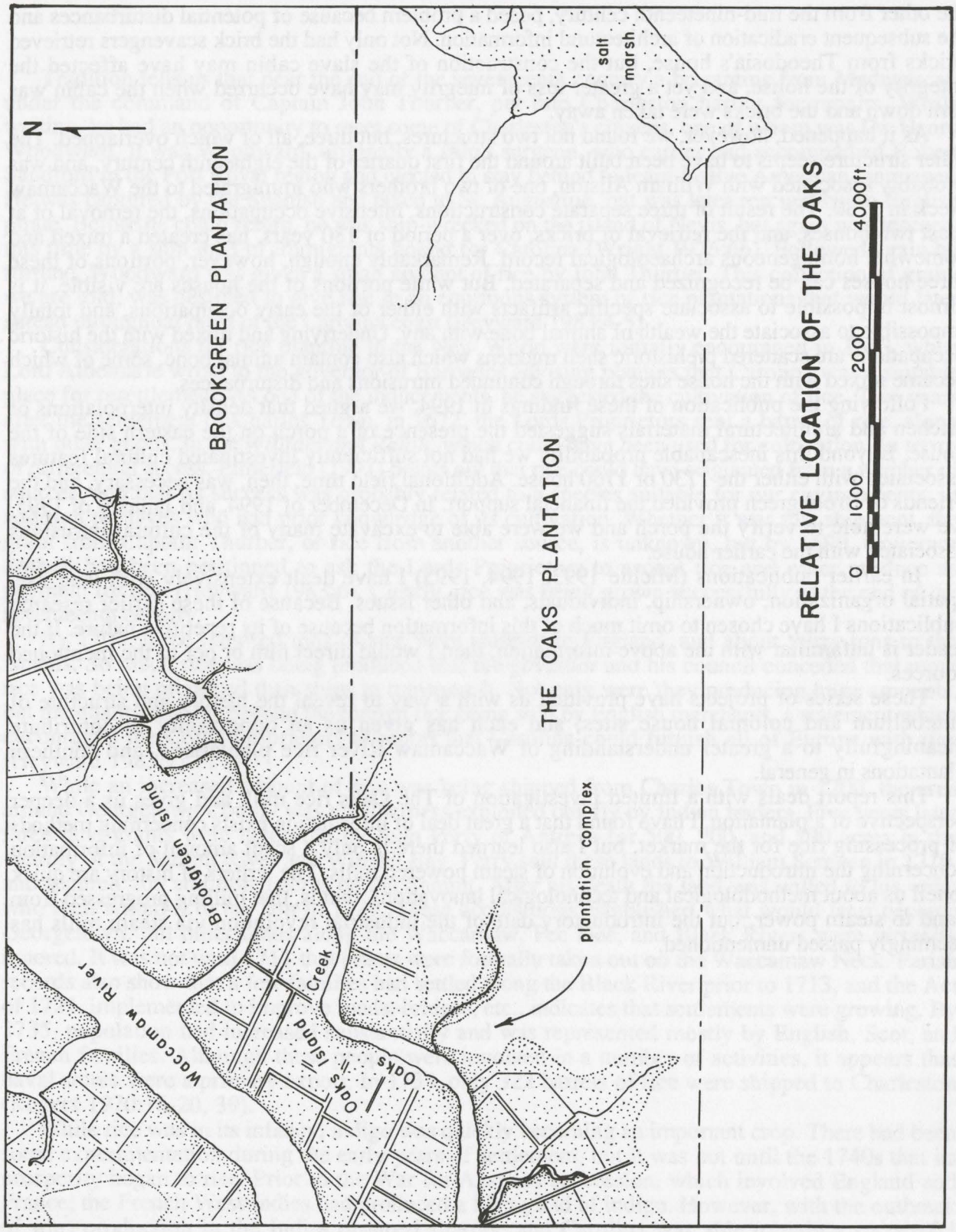


Figure 2. Relative Location of The Oaks Plantation.

the other from the mid-nineteenth century, posed a problem because of potential disturbances and the subsequent eradication of architectural information. Not only had the brick scavengers retrieved bricks from Theodosia's house, but the construction of the slave cabin may have affected the integrity of the house, and yet a greater loss of integrity may have occurred when the cabin was torn down and the bricks were taken away.

As it happened, however, we found not two structures, but three, all of which overlapped. The other structure seems to have been built around the first quarter of the eighteenth century, and was probably associated with William Allston, one of two brothers who immigrated to the Waccamaw Neck in 1730. The result of three separate constructions, intensive occupations, the removal of at least two houses, and the retrieval of bricks, over a period of 180 years, has created a mixed and somewhat homogeneous archaeological record. Remarkably enough, however, portions of these three houses can be recognized and separated. But while portions of the houses are visible, it is almost impossible to associate specific artifacts with either of the early occupations, and totally impossible to associate the wealth of animal bone with any. Underlying and mixed with the historic occupations are scattered prehistoric shell middens which also contain animal bone, some of which became mixed with the house sites through continued intrusions and disturbances.

Following the publication of these findings in 1994, we argued that density interpolations of kitchen and architectural materials suggested the presence of a porch on the eastern side of the house. Beyond this inescapable probability we had not sufficiently investigated cultural features associated with either the 1730 or 1760 house. Additional field time, then, was necessary, and the Friends of Brookgreen provided the financial support. In December of 1994, and January of 1995, we were able to verify the porch and we were able to excavate many of the cultural intrusions associated with the earlier house.

In earlier publications (Michie 1993, 1994, 1995) I have dealt extensively with land use, spatial organization, ownership, individuals, and other issues. Because of these earlier research publications I have chosen to omit much of this information because of its repetitive nature. If the reader is unfamiliar with the above information, then I would direct him or her to the mentioned sources.

These series of projects have provided us with a way to reveal the history and structure of antebellum and colonial house sites, and each has given us an opportunity to contribute meaningfully to a greater understanding of Waccamaw River rice plantations, and southern plantations in general.

This report deals with a limited investigation of The Oaks rice mill, and gives us a deeper perspective of a plantation. I have found that a great deal of information exists concerning methods of processing rice for the market, but I also learned there is only a scant amount of information concerning the introduction and evolution of steam powered mills. The writers of history are quick to tell us about methodological and technological innovations, that is, that milling progressed from hand to steam power, but the introductory date of the industrial revolution via steam mills has seemingly passed unmentioned.

RICE PLANTING ALONG THE WACCAMAW RIVER

Tradition tells us that near the end of the seventeenth century a brigantine from Madagascar, under the command of Captain John Thurber, put into Charleston harbor for repairs. While waiting, he had an opportunity to meet some of Charleston's citizens, one of whom was Dr. Henry Woodward. It was Woodward, originally a ship's surgeon, who earlier had accompanied Robert Sandford to the Port Royal region and elected to stay behind to learn Native American languages. He was captured by the Spanish and taken to St. Augustine, but was later rescued by an English pirate. Before he could return, he was ship-wrecked on the island of Nevis, but again was rescued, this time by a ship load of immigrants bound for Carolina (Wright 1976:66). Followed again by fortune, Woodward was given a small amount of rice by John Thurber. This collection of grain, we are told, was destined to give rise to an enormous system of rice plantations that would later spread throughout most of the Carolina coast (Heyward 1983:4-5).

Considerations for rice planting in the New World were initially encouraged in 1663, when Lord Albemarle wrote to the governor of Barbados advising planters that Carolina was a suitable place for resettlement. As one of the inducements, he suggested the cultivation of rice. Two years after the settlement of Charles Town, in 1672, the Lords Proprietors sent a barrel of rice, along with other goods, in the *William and Ralph*, which could have been used for cultivation. In terms of differential access, Littlefield (1991) points out that rice could have originated from a number of sources, and that its success was probably related to a species suitable for our environments, in addition to slaves who had prior knowledge of its cultivation. Whether it was this shipment, the grain from Captain Thurber, or rice from another source, is unknown, but by 1690, Governor Sothell had been petitioned to ask the Lords Proprietors to accept rice and other produce as payment for rent (Heyward 1983:6). Clearly, rice was being grown successfully at the end of the seventeenth century.

By 1700, three hundred tons of rice were shipped to England, and about thirty tons to the islands. So much rice was being produced that the governor and his council conceded that more rice was being produced than ships to transport it. Not only were they producing huge amounts, but the quality was far beyond the foreign rice being sold by English merchants, a statement which encouraged the Lords Proprietors to report that Carolina could furnish all of Europe with rice (Heyward 1983:7).

While an increased amount of rice was being shipped from Charles Town in 1700, the area around Georgetown County was a wilderness exploited chiefly by Indian traders. Five years later three land grants were taken out by John Perry of Antigua for 500, 200, and 100 acres in the vicinity of the Sampit River and Winyah Bay. Perry sold these lands to William Screven in 1710, and secured 200 additional acres on the Sampit. After his death the land was willed to his wife, who then willed it to her son in 1729. These acquisitions established what would later become Georgetown, but other lands along the Waccamaw, Pee Dee, and Black Rivers were virtually ignored. It was not until 1711 that grants were formally taken out on the Waccamaw Neck. Parish records also show that a few families had settled along the Black River prior to 1713, and the Act of 1721, implemented to improve roads, bridges, etc., indicates that settlements were growing. By 1735, population had increased substantially and was represented mostly by English, Scot, and French families. Although these people were involved in a number of activities, it appears that naval stores were a primary export. In 1734, only 322 barrels of rice were shipped to Charleston (Rogers 1970:16-20, 39).

While rice was in its infancy, indigo was quickly becoming an important crop. There had been some experimentation during the early years of settlement, but it was not until the 1740s that its prosperity began to rise. Prior to the War for Austrian succession, which involved England and France, the French West Indies had produced a high yield of indigo. However, with the outbreak of war, production in the Indies dropped sharply, and Carolina was able to gain a successful entrance into the indigo market. Several years later the British Parliament passed an act to

encourage more indigo production by granting a bounty of six pence sterling per pound if it sold for more than three pence per pound. The act stimulated production and was kept in force until 1770, when the bounty was reduced to four pence (Rogers 1970:88-92).

During this period of growth the economy was further stimulated by Moses Lindo, a London sorter who promised that he would not let first class Carolina indigo fall below twenty shillings per pound. Lindo kept his promise and indigo prospered until his death in 1774. Shortly afterwards, the London importers began to discriminate against the Carolina crop because the West Indies was able to produce indigo once again. Carolina never regained its selling price, and as a result indigo declined and stabilized (Rogers 1970:91, 53).

Rice was never dormant when indigo was showing great profits. In 1740, Beaufort and Georgetown exported 4,785 barrels of rice, but exports declined thereafter because of the increased rates of freight created by the war and the expansion of indigo. Rice production increased in 1755, and again in 1761, after which it continued to rise. By the 1780s indigo was declining and the rice planters were successful enough to ship processed grain from their own mills to Charleston. When George Washington visited Georgetown during his tour of the newly formed states, he noted *five or six hundred people whose chief export was rice* (Rogers 1970:167).

Rice flourished in the lowlands of Georgetown County because of the four major river systems that converged on the city. There were the Pee Dee, Waccamaw, Black, and Sampit Rivers, all of which were tidally induced. These river systems drained all of eastern South Carolina, and when the collective waters reached the coast there was so much fresh water that the ocean's salinity could not penetrate the enormous discharge. It was not only the broad, flat swamps that allowed for rice production, but it was the creation of a large delta and rich bottomlands formed by the reversal of tidal flow that allowed the constant precipitation of fresh nutrients to the soil. But the nutrients alone were not enough - the planters also relied on the natural hydraulics of daily fluctuating water that entered the swamps and made it all possible. There in the bottomlands the planter could build dikes around his fields to impound the water and control its level for rice cultivation.

Plantations were sold as narrow strips of land perpendicular to major rivers. This allowed upland as well as bottomland cultivation, and gave the planter a diversity of forested environments that offered hardwoods and pines. Initially, the acquisition of land was an expensive investment, but the planter also had to invest a great deal of time and additional money in preparing the land - a venture measured not in months but in years. In order to grow rice the planters needed thousands of black slaves from Africa to clear the land and then impound the swamps by a series of earthen dikes to keep out the daily rise of water. Then they built trunk gates to allow either the flooding or drainage of fields. Thousands of acres were cleared, mile after mile of canals were dug, houses and other buildings were constructed, and when it was completed the Georgetown plantations were producing tons of rice.

Rice cultivation, by no means, was accomplished easily. After all the dikes were in place, and when all of the flood gates were operative, the planter cultivated the land and sowed the seed. Afterwards, the fields were flooded and the planter waited until the first stem of the plant appeared. When this happened the fields were drained so that the young rice could establish a root, and when the plant began to grow, the fields were flooded once again to destroy unwanted grass and weeds. Again, the field was drained and the youthful rice was allowed to develop during this period of dry growth. The soil was constantly hoed to reduce grass and weeds and to aerate the packed earth. In the final stage the fields were again flooded to enhance additional growth, and when the green plants with their splendid seeds began to turn yellow, the crop was ready for harvest. The fields were drained and then slaves with sickles cut the stalks, tied them in bundles, and waited until the plant had dried before it could be threshed. If the planter failed to have his own threshing mill, he had to rely on those who did, and if he made it through all of the stages of rice planting and finally got the processed grain to market, then he could expect the financial rewards that accrue from success. If the dikes or the flood gates failed, if the seasonal arrival of rice birds went unchecked, or if the weather failed to cooperate, he could lose the entire crop. Rice planting was a risky business.

Forced labor was a large part of rice cultivation, and slaves began being imported into the district between the 1720s and the American Revolution by British ships financed by the merchants

of London, Bristol, and Liverpool. Afterwards, it was the Rhode Island traders, and then traders from a variety of sources shortly after the beginning of the nineteenth century. By 1808, however, slave importation was forbidden, but by then so many slaves had been purchased that their children had reached maturity and were available for the markets. So many slaves were in the district that between 1810 and 1860, they consisted of 85% to 89% of the population - a number that grew from 13,867 in 1810, to 18,109 in 1860 (Rogers 1970:342-343). In fact, it was rice cultivation on the Waccamaw Neck that made Joshua John Ward the largest slaveholder in the United States and the wealthiest planter in the Georgetown district. In the 1850s he owned nearly 1,100 slaves and was growing nearly 4,500,000 pounds of rice a year (Rogers 1970:524, 339).

The evolution and development of rice production, that is to say, its emergent form, is relatively unknown. Ulrich B. Phillips reported the beginning of tidal culture in 1758, by McKewn Johnston who planted on Winyah Bay, while another consideration comes from David Ramsey, who claims it was in 1783, by Gideon Dupont of Goose Creek (Rogers 1970:332). Exactly who was responsible may never be known with any degree of accuracy because it probably resulted from a continuous system of trial and error until perfection was achieved.

That rice cultivation developed successfully is demonstrated by the fact that in 1840, the Georgetown district produced 36,360,000 pounds of rice, nearly half of the rice grown in the United States. In 1850, it had risen to 46,765,040 pounds, and ten years later, on the eve of the Civil War, it produced 55,805,385 pounds (Rogers 1970:324). More rice was grown in the Georgetown district than any place on the east coast. Even though the area could not keep up with the expanding rice culture, relative to other regions of the nation, this awesome amount of local yield could only create a great deal of wealth for a small number of people, which it did quite easily.

Rice plantations existed in a continuous line from Winyah Bay up the Waccamaw and Pee Rivers, and along the Sampit and Black Rivers as long as there were flat bottomlands capable of being inundated by tidal fluctuation. Central to the Waccamaw Neck were the Allston/Alston families who, at one time or another, had owned practically all of the land and made fortunes from rice. The genesis of their dynasty began with two brothers who came to the wilderness in 1730, and began to acquire additional land which would later be converted into rice plantations by their descendants. Out of these families came senators, legislators, and governors, and others who were influential in state and local politics.

The plantation system was powerful and it controlled the destiny of the region. On the eve of the Civil War it seemed incapable of destruction, but when the opening volleys of cannon fire were directed at Fort Sumter in 1861, its existence became tenuous. During the succeeding years the planters came under the attack of Union gunboats and suffered economic loss from declining sales of rice. The gunboats directed occasional cannon fire on plantations, destroyed salt vats, and set fire to the rice fields whenever they had a chance. There were no major battles in Georgetown County, only occasional skirmishes with the enemy (Rogers 1970:387-415). But when the war was over, the emancipated slaves fled their plantations, and the planters were faced with the growing adversities of Reconstruction.

The industry stumbled along for a few decades, but in the end it collapsed. Although some planters continued to grow rice, it was becoming increasingly difficult. Some of the plantations had been burned by former slaves, others suffered under the stringent rules of forced labor contracts, while others simply stopped trying to raise a fallen system. In the midst of these problems, the weather even failed to cooperate - there were hurricanes and incessant rains that either limited production or simply drowned the crops (Rogers 1970:416-462). Shortly after the beginning of the twentieth century many of the rice plantations and their owners had virtually disappeared.

Little remains of these former plantations. At various locations along the rivers are a few surviving planter's houses. Fewer slave cabins exist, and the number of overseer's houses are less. The houses that managed to survive are related to several variables, but none are more apparent than land use and protective curation. Some houses apparently survived because they were fine examples of antebellum architecture and were sought after by people who could afford to

purchase large tracts of land and restore the houses. Other houses simply collapsed through neglect, while others were burned through carelessness.

What we see today is not an accurate representation of the past. There were once large examples of Georgian, Greek Revival, and Early Classical Revival styles of architecture placed at the end of live oak avenues and surrounded by formal gardens. But among these stately examples there were also smaller vernacular styles removed from the formalities of European styled architecture - simple houses that rested on brick piers, adorned not with brass door latches, marbled hearths, or crystal chandeliers, but houses with wrought iron hinges, crude latches, exposed end-gabled chimneys, and small porches. Yet, despite the investment or the appearance of houses, these planters owned a large number of slaves, and harvested millions of pounds of rice annually.

METHODS OF PROCESSING RICE

Introduction

Rice cultivation was labor intensive, and preparing rice for the market required much additional labor. The fields had to be dried for several days and then the rice was harvested with sickles, taken by boats to the adjacent uplands, and bound in sheaves where it was allowed to dry. Afterwards, the grains had to be separated from the stalk and then the protective husk and cuticle had to be removed from the kernel. This lenghty process slowly evolved from hand labor to steam powered machines.

Hand Processing

From the beginning of rice processing until the late eighteenth century fresh sheaves of rice were flailed in open yards covered occasionally with a thin mantle of clay. The clay prevented the loss of grain in the sand and made recovery easier. Flailing consisted of spreading out sheaves and then striking the ends with long sticks referred to as flails. The sticks were about the length of a hoe handle and were joined on the end with a strip of leather and a shorther stick, producing a long, flexible hinged implement. In effect, the handle was an extension of the arm which provided power, and the hinged end, like a whip, could be brought down with a great dcal of force, thus detaching the husked grain from the sheaf (Doar 1970:16).

The stalks were removed for animal food, bedding, and other uses, while the grain and smaller residue was swept and collected for winnowing. Winnowing could be accomplished either with the use of fanning baskets which were flipped in the wind, or by dropping it through the opening of an elevated structure known as a winnowing house.

After separation, the grains were poured into cylindrical wooden mortars, generally made from pine, and were pounded by wooden pestles, often made from the resinous heart of pine. Gentle but constant pounding and rotation of the pestle removed the husk and the cuticle.

Animal Powered Mills

The laborious method of hand-pounding began to give way to mechanical methods towards the end of the eighteenth century. Drayton (1972:121) tells us that there were pecker and cog mills designed to be driven by oxen, mules, or horses, and were capable of processing three to six barrels of rice daily. The pecker mill operated on a principle similar to the motion of a woodpecker, and the cog mill consisted of a horizontal wheel with cogs, all made from wood, that lifted and released upright pestles. The rice was first ground between wooden mills to separate the chaff from the grain, and the chaff was blown away with hand operated fans. It was then pounded in either style of mill until it was sufficiently polished and cleaned, and then it was was sifted through variable-sized wire sieves to remove dirt and flour, which also separated whole and broken kernals.

Water Powered Mills

Heyward (1983:23) tells us that planters had taken advantage of tidal flows to operate crude pounding mills long before Jonathan Lucas perfected a water powered mill for a Santee River plantation in 1787. Being an educated wheelwright from England, Lucas was in a position to apply the knowledge of his trade to more effective machinery. Several years later in 1801, he applied his design to steam (Heyward 1983:22).

The mechanisms of Lucas' mill are relatively unknown (Allston 1847:44), but Drayton (1972:122-123) outlines for us the operation of water powered mills in use in 1802. By taking advantage of tidal fluctuation, water was impounded in a reservoir and then allowed to escape through a wooden raceway. The power of escaping water turned a large undershot wheel which drove the mechanism. Accordingly, these wheels were quite large, some reaching 22 feet in diameter and 14 feet long. In order to take advantage of its processing potential, the mills were two stories high which allowed rice to fall through successive stages of processing. The drive shaft operated several cog wheels, a lantern pinion wheel, a pair of large mill stones, multiple pulleys with leather belts, rolling screens to sift the rice, wind fans to blow away the chaff, brushes, buckets which take the rice to the upper floor, and spiral horizontal conveyors.

Rough rice was taken to the upper floor and screened to remove soil and other debris, and was then poured between the grinding stones which separated chaff from the grain. The chaff was blown away by fans and the rice was then subjected to heavy pestles which struck the rice from 32 to 44 times a minute. When it became sufficiently pounded, the rice was taken by elevator buckets to rolling screens where the small rice and flour were separated. The whole, undamaged rice passed through a funnel and was subjected to brushes which removed flour and other small debris. Afterwards, the rice was blown clean and funneled into barrels for shipment.

Steam Powered Mills

Introduction

Although I have not been able to find out when steam powered mills were introduced to Georgetown County, Heyward (1983:22) tells us that Jonathan Lucas applied the principle of steam to a mill in 1801. Steam mills surely functioned similarly to their water powered counterparts and made their entry into the County in the first half of the nineteenth century, potentially during the second quarter. In order to understand when steam was first applied to rotary motion, and, hence, available to rice mills, I consulted Moser's (1994:639-647) review of steam engine history.

Steam Engine History

Accordingly, it was Hero of Alexandria who created a device that converted steam to energy about two thousand years ago. However, it was many centuries later when the expansive properties of steam were fully appreciated and realized. It was not until the seventeenth century that steam engines progressed in power and efficiency, and not until the nineteenth century that the steam age became a reality.

The first practical application of steam is noted in an apparatus designed to raise water. It was the Italian mathematician Giambattista della Porta who first conceived the idea in 1602, expanded on by Salomon de Caus in 1615, and developed by Edward Somerset of Worchester in 1663. The first commercially successful steam engine was patented by Thomas Savery in 1698, who used his device to pump out the flooded mines of Cornwall. Savery's engine operated simply on principles of condensation and suction - there were no moving parts.

The first engine to operate on the principle of a steam forced piston was introduced soon after Savery's invention. Denis Papin introduced the idea that steam could act against a piston and thereby activate a mechanism, but it was Thomas Newcomen who patented, in 1712, the first engine worthy of such an idea. Newcomen's engine had a boiler and a vertical steam cylinder with a piston and a connecting rod. The connecting rod was attached to an elevated counterbalanced beam. Steam pushed the piston upwards thus lowering the opposite end of the beam and a pump rod. A spray of cool water was ejected into the cylinder thereby causing rapid condensation and creating a partial vacuum which then provided power for a reverse stroke. The later introduction of automatic valves provided an efficiency of 10 to 16 strokes per minute for the reciprocating engine, but the apparatus was used only to pump water.

The Newcomen engine with its piston and rod was a great advance over earlier models, but it was James Watt, a Scot with the University of Glasgow, who significantly improved the design and helped usher in the industrial revolution. Watt's improvements, among other things, included insulating the piston cylinder to retain heat and prevent condensation, and providing a valve system at each end of the cylinder which continuously kept the piston in motion. The engine, like the earlier Newcomen model, still produced reciprocating motion and had no application other than pumping. His patent of 1769 gave the engine increased performance, but it was incapable of developing rotary motion.

Watt realized that reciprocating motion had no application for the industrial revolution - he needed rotary motion. The improvement came in 1781, when he attached a sun-and-planet gear to the connecting rod on the opposite end of the counterbalanced beam. In other words, the rod was attached off-center of a large flywheel which allowed for a continuous revolving motion.

Watt's patent expired in 1794, and his engine was available to anyone. Not only did the expiration release his main achievement, but it included the invention of a throttle valve, a governor for regulating speed, a counter for recording the number of strokes, and an indicator for ascertaining the work done by steam. Since then, improvements to Watt's steam engine have consisted chiefly of perfecting the mechanism to reduce thermal and mechanical losses, utilizing the advantage of steam's expansive forces, and applying this efficiency to various needs.

Steam powered rice mills, therefore, had to postdate the 1781 patent of the rotary engine invented by James Watt.

Steam Powered Mills

Historians have not been able to tell us a great deal about the steam powered mills. We know that it was in use in the nineteenth century, it replaced water mills, it was efficient, and it was costly. We know, too, that many components of machinery were cast iron, but we know nothing about who manufactured boilers, pipes, pistons and cylinders, flywheels, bearings, gears, pulleys, or rotating screens. From photographs we note that each mill had a massive chimney detached from the large, two story mill structure, and each was positioned strategically near the barn and the barge canal.

In the near absence of information we presume that steam power performed the same task as water powered mills, i.e., the husk was ground away between large stones, that the residue was blown away by fans, that it was pounded beneath pestles, that it was sifted, separated, and brushed clean, and loaded automatically into barrels.

Steam mills, like water mills of the antebellum South have largely disappeared. Components have been scavenged, sold, or otherwise discarded, grinding stones now adorn lawns and paths, the structures have burned or rotted, and often the tall chimneys are all that remain.

RICE MILLS OF GEORGETOWN COUNTY

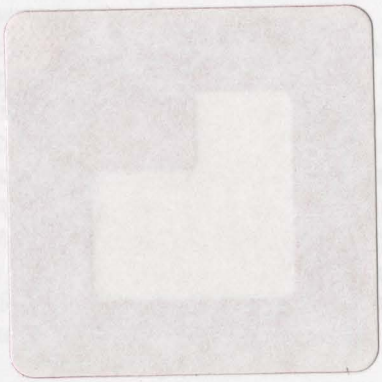
Contrary to what some writers tell us (Heyward 1983:41), not every plantation enjoyed the luxury of a rice mill. Rogers (1970:335) tells us that while large plantations milled their own rice, they also milled their neighbors' rice. If the planter could not find a local mill with an acceptable price, he had the option to send the rough rice to Georgetown or Charleston where it was left in the hands of the factor. Of approximately 210 plantations located on the Santee, Black, Sampit, Pee Dee, and Waccamaw Rivers, only a few had the convenience of a rice mill. With so many plantations and a limited number of documents it would be difficult to ever learn the number of plantations that operated without mills, those that converted earlier water mills to steam, or those that later abandoned what they had for mills in Georgetown and Charleston.

Rogers (1970:335, citing Products of Industry, South Carolina, Eighth Census), states there were eleven rice mills in the district in 1860, in which $440,000 had been invested. In the same paragraph, he says that Jonathan Lucas built mills at Fairfield, Dover, and Millbrook in the eighteenth century, and by 1850, there were mills at Keithfield, Weymouth, Hagley, Waverly, and Richfield plantations. We are also told that the steam mill in Georgetown was sold in 1838. The mills collectively mentioned by Rogers are only nine.

Clearly, there was a large steam mill at Laurel Hill on the Waccamaw; the Federals destroyed one on Winyah Bay during the Civil War; the mill of William Bull Pringle was threatened in 1866; the son of R.F.W. Allston, Ben, had one; and Joshua John Ward of Brookgreen had one (Rogers 1970:377, 389, 413, 432, 437, 469). Valch (1993:127) mentions the steam mills at Chicora Wood and Mansfield, Salmon (1988:112) and Tarbox (1988:99) mention additional mills at Springfield and The Oaks plantations, and Lachicotte (1989:180-181) adds Milldam to the growing list. With this information, then, there were at least nineteen on the eve of the Civil War, suggesting that about 10% of the planters had mills. After the War there were many social and economic problems affecting rice cultivation, and as a result, the number of mills dropped significantly. Accordingly, between 1876-1900, there were only two: Waverly and the public mill in Georgetown (Rogers 1970:465).

I have been unable to find any statement regarding the initial appearance of steam power in the County. Rogers (1970:263, 335) tells us that Waverly was rebuilt in 1837, and converted to steam in 1850, and tradition has it that the Mansfield mill was built after 1840 under the ownership of Francis Parker (Michie 1996). The conversion to steam is relatively unknown.

Architecturally, we know only a little about steam mills, and functionally we know less. Old photographs, where most of our information is found, depict relatively large two-story wooden structures covered in clapboard with steeply pitched wooden shingle roofs. Some examples, like those at Waverly and Chicora Wood, have shed-like attachments. Glazed windows are often observed on both floors, but the number of windows relative to structural size are variable. Detached from the mills, surely to reduce fire hazards, are the boilers and large brick chimneys.



PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

The first professional survey of The Oaks by qualified archaeologists occurred when the former President of Brookgreen Gardens, Gurdon L. Tarbox, Jr., hired Carolina Archaeological Services in 1980. For a brief time - a period of two weeks - Dr. Lesley Drucker and Mr. Ron Anthony, conducted a survey of Laurel Hill (38GE196) and The Oaks (38GE202) noting observable cultural features, topography, and by excavating a small number of 1/2 meter units. Subsumed in their activities was a reconnaissance of The Oaks rice mill (38GE203). In addition to mapping several cultural features at the mill and its associated area, they excavated a single 1/2 meter unit northwest of the collapsed remains and three similar units a few hundred feet to the north (Figure 3). Their excavation units disclosed a light scatter of prehistoric materials (Drucker 1980:70-74).

The researchers noted they were unable to find any information regarding a construction date, records of use, or abandonment. In the absence of information, but knowing the plantation had been productive since the third quarter of the eighteenth century, the author speculates the mill was built in the latter part of the eighteenth century and converted to steam in the nineteenth century, stating that the rice mill operation occurred between 1784 and 1860. (Drucker 1980:39, 70).

RESULTS OF THE INVESTIGATION

Introduction

The investigation of The Oaks rice mill was not intended as a program of artifact recovery, but was oriented towards floral identification, the clearing of vegetation, and accurately mapping all relative features such as brick scatters, ditches, intact brick footings, the associated barge canal, and the adjacent depression associated with soil removal. In the process of clearing we began to note additional brick footings which demanded subsurface probing and limited soil removal to understand the location, extent, and design of structural components. In the process of removing soil and brick rubble we found numerous artifacts related to architecture and machinery. All of the artifacts were reburied where each had been found and the shallow investigations were filled with soil and brick fragments.

The Setting

The rice mill is situated about 800 feet (240m) south of the plantation's managerial complex and lies 50 feet (15m) east of the barge canal and the old rice fields (Figure 4). Relative to other areas of the plantation, the mill site is low, elevated only six feet above the marsh. The environment is not unlike other low lying upland areas of Georgetown County lying adjacent to broad, flat swamps. Towards the north, with greater elevation, the forest is relatively open and supports, among other vegetation, a hardwood community of medium-sized laurel oaks intersperced with occasional live oaks, sweetgum, and a few longleaf pines. The mill site is situated on a lower elevation and is surrounded by a community of higher numbers of sweetgum, a few loblolly pines, a few live oaks, and mixed stands of great cane, waxmyrtle, and yaupon holly. Along the edge of the marsh there are tupelo and bald cypress.

Upland soils are predominately sandy, underlain with a dense, compact reddish clay, and are characterized as Chisolm sand (Stuckey 1982:13). The rice fields, flooded daily with fresh water from the Waccamaw River, are composed of Hobonny muck (Stuckey 1982:16). Areas of marsh and swamp located to the south and east of the mill exemplify similar wetness and may be characterized as Johnston loam (Stuckey 1982:17).

The Structure

The interior of the former structure is littered throughout with undulating mounds of brick fragments and is covered with a slight humus and decomposing leaves. An intact subsurface wall of brick measuring 39.3 feet (11.79m) emerges slightly from the soil and forms the northern edge. Portions of two additional walls extend southward for a distance of 21.0 (6.3m) and 14.0 feet (4.2m), respectively. These basal portions of the wall are two courses wide and are laid in a pattern of running bond. About six feet from the beginning of the western wall is a brick arch at ground level that faces a shallow ditch. The ditch extends towards the northwest for a distance of about 10.0 feet where it turns sharply and heads to the north for a distance of about 40.0 feet (12.0m). At this point it terminates in a cluster of brick fragments. Functionally, the ditch may have been a conveyance for steam pipes and the brick cluster may represent all that remains of the chimney.

Towards the south and southeast are two deep brick scavenger's ditches forming a right angle. The southeast ditch begins at the termination of the brick wall, turns and continues towards the west and then ends at the western trench which was previously filled with mortar, brick rubble,

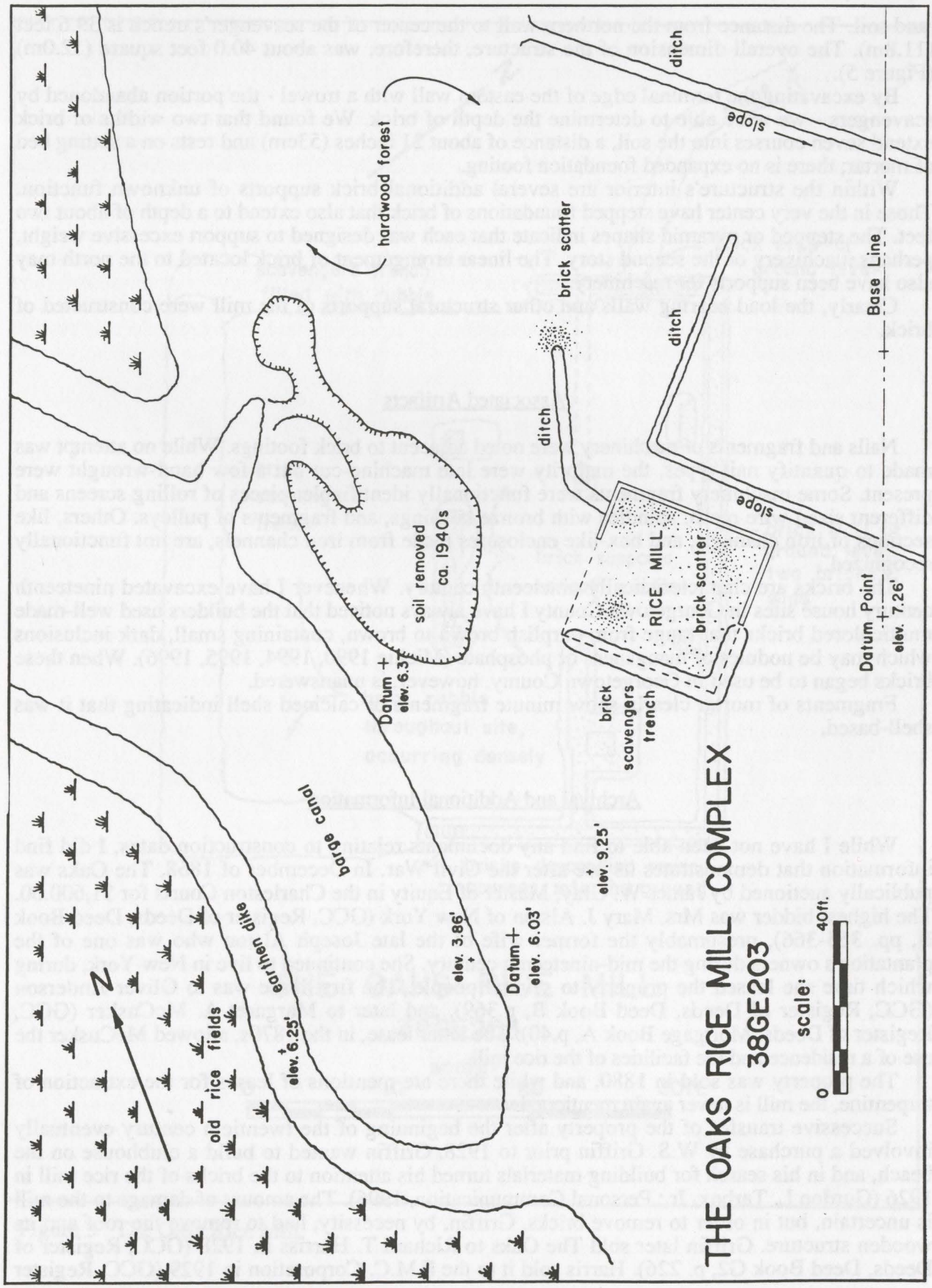


Figure 4. The Oaks Rice Mill Complex.

and soil. The distance from the northern wall to the center of the scavenger's trench is 39.6 feet (11.8m). The overall dimension of the structure, therefore, was about 40.0 feet square (12.0m) (Figure 5).

By excavating the terminal edge of the eastern wall with a trowel - the portion abandoned by scavengers - we were able to determine the depth of brick. We found that two widths of brick extend seven courses into the soil, a distance of about 21 inches (53cm) and rests on a setting bed of mortar; there is no expanded foundation footing.

Within the structure's interior are several additional brick supports of unknown function. Those in the very center have stepped foundations of brick that also extend to a depth of about two feet. The stepped or pyramid shapes indicate that each was designed to support excessive weight, perhaps machinery or the second story. The linear arrangement of brick located to the north may also have been supports for machinery.

Clearly, the load bearing walls and other structural supports of the mill were constructed of brick.

Associated Artifacts

Nails and fragments of machinery were noted adjacent to brick footings. While no attempt was made to quantify nail types, the majority were late machine-cut but a few hand-wrought were present. Some machinery fragments were functionally identifiable: pieces of rolling screens and different sized wire mesh. spindles with bronze bushings, and fragments of pulleys. Others, like sections of iron channels, and box-like enclosures made from iron channels, are not functionally recognized.

The bricks are characteristically nineteenth century. Whenever I have excavated nineteenth century house sites in Georgetown County I have always noticed that the builders used well-made multicolored bricks that range from purplish brown to brown, containing small, dark inclusions which may be nodules of manganese or phosphate (Michie 1990, 1994, 1995, 1996). When these bricks began to be used in Georgetown County, however, is unanswered.

Fragments of mortar clearly show minute fragments of calcined shell indicating that it was shell-based.

Archival and Additional Information

While I have not been able to find any documents relating to construction dates, I did find information that demonstrates its use after the Civil War. In December of 1868, The Oaks was publically auctioned by James W. Gray, Master of Equity in the Charleston Courts for $1,600.00. The highest bidder was Mrs. Mary J. Alston of New York (GCC, Register of Deeds, Deed Book B, pp. 365-366), presumably the former wife of the late Joseph Alston who was one of the plantation's owners during the mid-nineteenth century. She continued to live in New York, during which time she leased the property to several people. The first lease was to Oliver Anderson (GCC, Register of Deeds, Deed Book B, p.369), and later to Margaret A. McCusker (GCC, Register of Deeds, Mortgage Book A, p.40). The latter lease, in the 1870s, allowed McCusker the use of a residence and the facilities of the rice mill.

The property was sold in 1880, and while there are mentions of leases for the extraction of turpentine, the mill is never again mentioned.

Successive transfer of the property after the beginning of the twentieth century eventually involved a purchase by W.S. Griffin prior to 1928. Griffin wanted to build a clubhouse on the beach, and in his search for building materials turned his attention to the bricks of the rice mill in 1926 (Gurdon L. Tarbox, Jr.: Personal Communication, 1996). The amount of damage to the mill is uncertain, but in order to remove bricks, Griffin, by necessity, had to remove the roof and its wooden structure. Griffin later sold The Oaks to Richard T. Harriss in 1928 (GCC, Register of Deeds, Deed Book G2, p. 226). Harris sold it to the F.M.C. Corporation in 1929 (GCC, Register

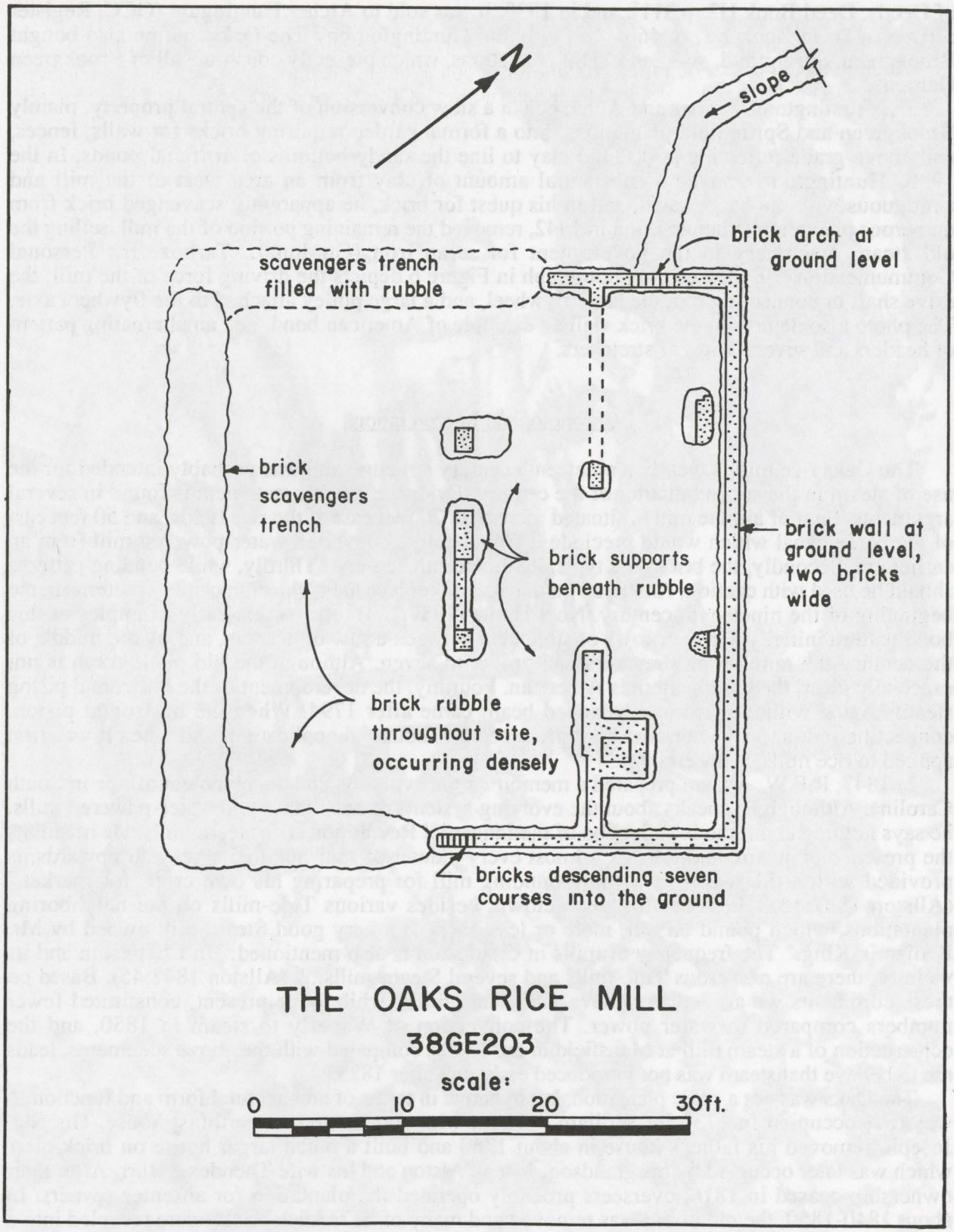


Figure 5 . The Oaks Rice Mill.

of Deeds, Deed Book H2, p.311), and in 1930, it was sold to Archer Huntington (GCC, Register of Deeds, Deed Book X1, p. 460). Not only did Huntington buy The Oaks, but he also bought Brookgreen, Springfield, and Laurel Hill plantations, which presently constitute all of Brookgreen Gardens.

The Huntingtons, Archer and Anna, began a slow conversion of the central property, mainly Brookgreen and Springfield plantations, into a formal garden requiring bricks for walls, fences, and above-grade reflecting pools, and clay to line the sandy bottoms of artificial ponds. In the 1930s Huntington removed a substantial amount of clay from an area west of the mill and contiguous with the barge canal, and in his quest for brick, he apparently scavenged brick from numerous plantation structures, and in 1942, removed the remaining portion of the mill, selling the old steam machinery to the government for scrap iron (Gurdon L. Tarbox, Jr.: Personal Communication, 1996). The old photograph in Figure 6 depicts the driving force of the mill: the drive shaft or connecting rod, the large flywheel, and a large pulley attached to the flywheel axle. The photo also depicts in the brick wall an example of American bond, i.e., an alternating pattern of headers and several rows of stretchers.

Chronological Interpretations

The Oaks rice mill is clearly a nineteenth century structure and was probably intended for the use of steam in the second quarter of the century. Evidence for this statement is found in several arguments. First of all, the mill is situated more than 70 feet east of the rice fields, and 50 feet east of the barge canal which would preclude it from being a converted water-powered mill from an earlier era. Secondly, the bricks are typically nineteenth century . Thirdly, while bonding patterns should be used with caution, American bond began to replace the eighteenth century patterns in the beginning of the nineteenth century. Noel Hume (1987:123) tells us that early examples of this bond pattern initially had four rows of stretchers between a row of headers, and by the middle of the century the number of stretchers had grown to seven. Although the old photograph is not especially clear, the bond pattern is American. Fourthly, the development of the horizontal piston steam engine without a counterbalanced beam came after 1794. When the horizontal piston, connecting rod, and flywheel was first produced for industrial application, and when it was first applied to rice mills, is uncertain.

In 1847, R.F.W. Allston prepared a memoir on the evolution and development of rice in South Carolina. Although he speaks about the evolving systems of hand labor and water-powered mills, he says nothing about the introduction of the Industrial Revolution with steam mills. He mentions the presence of steam, and tells us "almost every planter of four hundred acres and upwards, is provided with a tide-water or Steam pounding mill for preparing his own crops for market." (Allston 1847:45). He adds, "In Georgetown, besides various Tide-mills on the neighboring plantations, which pound on toll, more or less, there is a very good Steam-mill owned by Mr. Benjamin King." The frequency of mills in Charleston is also mentioned: "In Charleston and its vicinity, there are numerous Tide-mills and several Steam-mills..." (Allston 1847:45). Based on these comments we are led to believe that steam mills, while once present, constituted fewer numbers compared to water power. The conversion of Waverly to steam in 1850, and the construction of a steam mill at Mansfield in the 1840s, compared with the above statements, leads me to believe that steam was not introduced early, but after 1825.

The Oaks was not a static plantation, but dynamic in terms of architectural form and function. It was first occupied in 1730 by William Allston, who constructed an earthfast house. His son, Joseph, removed his father's house in about 1760 and built a much larger house on brick piers which was later occupied by his grandson, Joseph Alston and his wife Theodosia Burr. After their ownership ceased in 1816, overseers probably operated the plantation for absentee owners. In about 1840-1850, the old house was removed and many of its reddish bricks were recycled into a smaller house, probably occupied by an overseer. At about the same time a slave cabin was constructed over the remains of the old Allston/Alston house, and two opposing rows of slave

Figure 6. Demolition of The Oaks Rice Mill and Associated Steam Machinery.

cabins were built in the uplands east of the managerial complex. Included in this change may have been the construction of the steam powered rice mill.

Testing in the immediate vicinity of the 1840-1850 overseer's house revealed many late machine-cut nails, in addition to a small number of hand-wrought nails. The chimney foundation was constructed with reddish brick recycled from the older Allston/Alston house, but the piers were built from darker nineteenth century brick similar to those found in the nearby slave cabin, those in the opposing rows of slave cabins, and those in the rice mill. Not only did the builders recycle brick from the old house site, but they probably recycled lumber and its associated hand-wrought nails. With recycling obvious in the 1840-1850 structure, I find it tempting to consider temporally related recycling of lumber and nails into the rice mill, and hence, a plausible date of construction.

SUMMARY AND RECOMMENDATIONS

Investigations at The Oaks rice mill (38GE203) were oriented towards a brief reconnaissance which included clearing of vegetation; and mapping existing structural features, associated ditches, and portions of the barge canal. A large portion of the mill was scavenged for brick between 1926 and 1942, leaving portions of the wall level with the ground. The wall does not appear to have been built on a foundation of expanded footings. The intact bricks and the trench created by brick scavengers demonstate the structure was about 40 feet square.

While the date of construction is unknown, at least two things suggest a nineteenth century date, i.e., the use of dark brick and a pattern of American bond. That the mill was converted from water power to steam is untenable because it was built more than 50 feet from the edge of the rice fields and in front of the barge canal. Given this location, the mill was probably intended for steam.

A search through published and unpublished sources has not yielded any information about the introduction of steam powered mills in Georgetown County. Although additional research is needed, it may well be the use of steam was not appreciable, if at all, until the second quarter of the nineteenth century.

The ditch associated with the small brick arch may have contained steam pipes that led from the chimney and boiler to the machinery. The other ditches, located to the north, are functionally unrecognized.

Clearly, a great deal of work remains to be done. I would recommend a comprehensive search for additional information concerning steam powered rice mills, especially pertaing to: 1) the introduction of steam in Georgetown County, 2) the organization and placement of pipes and machinery, and 3) the name and location of manufacturers who were responsible for making the equipment, and 4) the overall efficiency of those mills compared to other types. Archaeological work at The Oaks' mill should be directed towards an understanding of chronology, structural and architectural form, associated artifacts, and the former function of now fragmentary machinery. Beyond this, future archaeological research should address the question of barn location. By necessity, the mill would have required a large storage facility located near the mill.

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GCC Georgetown County Courthouse

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